MODELING WATER LOSSES FROM STREAMS IN KARST AREAS

Leslie R Livingstone[1], C. Warren Campbell[1] and Reggina Garza[2]

AUTHORS: [1]Department of Civil and Environmental Engineering, The University of Alabama in Huntsville, Huntsville, Alabama 35899; and [2]National Weather Service Southeast River Forecast Center, 4 Falcon Drive, Peachtree City, Georgia 30269.
REFERENCE: *Proceedings of the 1997 Georgia Water Resources Conference*, held March 20-22, 1997, at the University of Georgia, Kathryn J. Hatcher, Editor, Institute of Ecology, The University of Georgia, Athens, Georgia.

Abstract. The Withlacoochee River loses water to the Floridan aquifer in a sinkhole area north of Valdosta, Georgia. If the river flow is less than 1.6 cms (cubic meters per second), all the flow is lost to a series of sinkholes and swallets. During some high flows, the U.S. Geological Survey has measured losses as much as 10 cms.

The current National Weather Service River Forecast System (NWSRFS) does not adequately account for these losses, and can over-forecast river stage. This effort will develop an addition to the NWSRFS to account for losses in karst areas. The uncertainty and frequency of recalibration were studied.

Reviews of USGS and NWS data indicate that plugging may cause loss fluctuations. We have observed this phenomenon in Saturday Cave in north Alabama. When a pit leading to the lowest level of the cave is clear, the small surface stream can lose as much as 2 cms. However, when sediment plugs the pit, our analyses show that the cave will take only 0.02 cms. The subsurface flow is rerouted to the surface stream, significantly reducing aquifer recharge.

We believe that yearly floods gradually plug the passage over a period of months and years. A very large multi-year flood can flush the passage clear, rerouting the flow to the aquifer. Coarse woody debris initiates plugging, followed by small boulders, cobbles, gravel and sand. We suspect a similar mechanism may control losses from the Withlacoochee River.

This periodic plugging would affect the accuracy of forecasts, requiring periodic recalibration of any model. We are evaluating a linear Darcy model, a conduit flow model, and a combination of these.